DOCUMENT RESUME

ED 351 954 HE 026 016

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TITLE Assessment of Critical Thinking in Postsecondary Education.
PUB DATE [92]
NOTE 11p.
PUB TYPE Information Analyses (070)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Measurement; Cognitive Tests; College Students; *Critical Thinking; *Educational Testing; *Evaluation Methods; Higher Education; Intelligence Tests; Measures (Individuals); *Student Evaluation; Thinking Skills

ABSTRACT

This paper examines ways in which the teaching of critical thinking skills at the college level have been evaluated. It is noted that two problems exist in using validated tests for critical thinking: (1) intelligence tests do not address critical thinking in specific courses or fields of knowledge; and (2) validated tests are not designed to measure the open-ended problem solving features of critical thinking. Several examples of measuring critical thinking are briefly outlined: the Watson & Glaser Critical Thinking Appraisal instrument; the Critical Thinking Worksheet (used for beginning students of philosophy and informal logic classes); the use of the scientific process in teaching and measuring critical thinking; Chickering's Critical Thinking Behaviors; and an assessment device employing the Measure of Intellectual Development essay test and the Reflective Judgment Interview, a moral and ethical dilemma questioning approach. The paper concludes that all college students should be required to successfully complete critical thinking courses. Contains 15 references. (GLR)

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Assesment of Critical Thinking in
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Assesment of Critical Thinking in Postsecondary Education

In colleges, how can the results of critical thinking teaching be measured? The quick anser is - by the use of validated tests. However, there are two important caveats which suggest serious drawbacks to this 'solution'.

1- Intelligence tests, as examples, require students to utilize general knowledge which is presumed to be available to anyone. Critical thinking, however, requires factual knowledge in the specific area in which such thinking takes place. In general, these intelligence tests do not measure the development of critical thinking relating either to specific courses or fields of knowledge.

2- Valuable critical thinking skills often involve open-ended problems for which many responses are equally appropriate to the solutions to the problems. Often, such existing validated tests may not reveal such kinds of critical thinking. This is due to the fact that they have been scored for one particular 'right' answer. Additionally, such existing validated tests are not designed to measure the critical thinking processes utilized in reaching a solution to such open-ended problems.

As the author has noted elsewhere (Blai, 1989: p.157)

> "The honing of thinking skills (those skills which comprise the varied dimensions of cognitive development) is not automatically achieved in subject matter instruction. The ability to formulate problems; to resolve issues; to determine the most effective decisions; to create effective solutions to problems - are particular and specific thinking skills which must be developed.

Additionally, Robert Ellis (1985) postulates critical thinking as the principal dimension to be learned in order to think effectively. As Pressiesen (1986, p.8) points out:

> "He considers critical thinking to be the reasonable reflective thinking one performs when deciding what to believe or do. It involves both dispositions and abilities such as inference, induction, and deduction..... Ennis also stresses the importance of clarity of information to inform thinker's decisions."

Further, Presseisen (1986) suggests four types of higher-order thinking processes. She categorizes them by the outcomes sought through each of these cognitive , complex processes; i.e., Problem-solving; Decision-making; Critical Thinking; Creative Thinking.

A review of the literature reveals that in the cognition area, much of it:

> "is concerned with how the more complex thinking - critical and creative, decision-making and problem-solving - develops through the student's learning experience." (Presseisen, 1986, p.10)

Today, it is generally acknowledged that the on-going success of college-level courses in critical thinking is in large measure a 'response reflex'. It is common knowledge that there has been a steady deterioration in the quality of communication skills offered by secondary students seeking further schooling.

As Pascerella (1987; pp 5-6) Has pointed out:

> "A major aim of American higher education has been to enhance one's ability to think critically, to reason and to evaluate and weigh evidence judiciously in making decisions and choices among alternate courses of action. ... This cluster of intellectual skills has often been labeled 'critical thinking ability' (and it has equally as often been identified as one of the major outcomes of higher education."

Further, the National Institute of Education (1984), and Macmillan (1986) both issued reports on the quality/character of American education. As Pascarella (1986) notes, each:

> "... stressed the fostering of one's ability to thinkcritically as one of the indispensable impact of an undergraduate education". (p.6)

Adding a person touch of historical perspective to this discussion, (Blai, 1972) as Director of Research, Harcum Junior College (a two-year college for women located in Bryn Mawr, Pennsylvania) issued an in-house Institutional Report in 1972; i.e., "How Harcum Helps Close Critical Thinking Gap". The Watson & Glaser Critical Thinking Appraisal instrument was administered

on a pre-and-posttest basis.

As Watson & Glazer (1964) note:

" The ability to think critically has long been recognized as a desirable objective. Several experimental studies, carried out at the elementary and college levels, demonstrate that critical thinking can at least be improved as a result of training directed to this end."(p.12)

A random sample of 60 September 1970 freshmen were posttested just prior to Harcum graduation with the Watson & Glaser Critical Thinking Appraisal instrument: (all freshmen had been pre-tested during Orientation Week with this instrument. The results revealed the following:

N = 60
Average pre-test percentile rank = 17
Average posttest percentile rank = 47
Difference = 30

(Range of pre-and-posttest differences: 9 through 76)

To determine if the obtained difference between the means of the pre-and-posttesting scores was likely to be a chance one or statistically significant, the t-ratio test was applied to the data, the result being t-7.4 .

Since a t-ratio of 3 is a virtual certainty (99.87 chances out of 100) that a true difference in means exists, one larger than 3 is that much more assurance of a statistically significant difference; i.e., one extremely unlikely to have occurred by 'chance' or sampling fluctuation alone. It is therefore with a very high level of confidence that it is concluded the 30 percentile difference in average performance is not a 'sport' variation, but rather evidence that a real difference exists.

Therefore, for this sample of Harcum graduates of 1972, their two-year Harcum attendance is associated with a substantial improvement in their critical thinking as measured by the Watson & Glaser Critical Thinking Appraisal instrument.

In the teaching of critical thinking Agnew (1986) at Saddleback College,

California, developed a pedagogical aid, a Critical Thinking Worksheet, utilizing it for beginning students of philosophy and informal logic classes. Using a handout document she:

1) introduced such essential terms as 'arguments', 'conclusions', and 'reasons' or 'premises'.

2) she next required the students , with reference to a brief written paragraph, to identify the premises and conclusions.

3) next, she guided their discussion through the steps in the process of critical thinking, covering:

a) ambiguous terms
b) the truth of the premises
c) the strength of the argument
d) the use of emotive tone
e) the fallacies in the argument
f) counterarguments
g) a summary assessment
h) additional information needed
i) response to counterarguments, and
j) the student's own views

Additional handouts she furnished provided students with assistance in verifying the truth or falsity of the premises of an argument and identifying kinds of fallacies; e.g.,

(1) hasty generalizations
(2) false issues
(3) arguments resting soley upon the strength of an authority
(4) arguments against the person making the claim, rather than the claim itself, and
(5) appeals to emotion.

After using the Critical Thinking Worksheet, the students were to write on a new topic and provide their own examples. Agnew (1986) then concludes:

> "The results I have received are nothing short of astonishing; thoughtful and reflective essays on a variety of topics. The radical improvement in the student's papers can be illustrated with this fact: prior to the use of the worksheet, about 60% of the students would write an essay which consisted of an exegesis of a particular philosopher's view, and would not make critical comments at all; only 40% of the students made critical comments of any kind, and fewer than 10% of the students specified their

view. Since I introduced the worksheet into philosophy classes, 100% of the students include critical evaluations in their essays, and they all express their own views, with varying degrees of skill in the evaluation and support of their own view." (p.13)

A second useful instructional technique is noted by Logan (1987) at Santa Monica College, California. She has utilized it for about a decade in a year-long, lower division biology course. As Logan (1987) notes:

" The general plan is to identify and clearly define critical thinking skills for students, model them, and give students frequent feedback by describing what they are doing and evaluating it. for instance, the teacher can help students distinguish between clarification of the hypothesis and analysis of it." (p.3)

Logan(1987) further notes that in her discussion she considers:

1) the link between critical thinking and scientific processes;

2) the individual critical thinking skills described in the course; i.e., description and definition, application, deduction and inference, and induction;

3) focusing on the use of the scienfific process to teach critical thinking, defining and providing examples relating to scientific hypotheses and conclusions, data analysis - the interpretation of results, and the construction and evaluation of models of the phenomenon under study;

4) examines ways in which critical thinking can be fostered by exams, citing examples of both essay and objective questions, and

5) explores the role of the teacher in developing critical thinking.

As Logan (1987) points out:

"The scientific process is a method for evaluating observations and experiences in the world in order to discover underlying principles that govern nature. It is a strong-sense critical thinking since the practitioners must ask such QUESTIONS as:
-is the evidence sufficient to allow this conclusion?
- is this the only conclusion that this evidence supports?
- is the evidence reproducable and reliable?

The scientific process is used to teach critical thinking in a reductionist approach because of 1) the isolation of single steps in reasoning, and 2) the emphasis on using only measurable techniques seem to provide fairly unambiguous examples of reasoning." (p. 3-5)

Logan (1987) also carefully indicates that the specific assignments described and discussed are not necessarily appropriate for all kinds of classes. She does conclude, however, that:

> "....the general concepts should be useful, and it should be possible to tailor assignments to different levels, using these models for ideas." (p.3)

In the assessment of critical thinking learning, as Hart (1989) notes:

> "Because of the limitations of existing tests (to measure critical thinking capabilities), most faculty members who want to assess thinking in their own classes may be best served by tests they construct themselves. These tests should prove opportunities for students to use the important knowledge and skills of the course in a new context - a context different from the one in which the knowledge and skills were taught. For example, through essays, interviews, simulations, discussions and other such techniques, students can be asked to use what they have learned to solve a problem they haven't encountered before - a problem that can't be answered simply by recalling what the teacher or the textbook said" (underlining supplied) (p.1)

Hart (1989) further notes:

> "In spite of the drawbacks existing, standardized tests can be used effectively in several ways. They provide opportunities for teachers or researchers to compare results with others. More importantly, such tests can help faculty members design their own measures of thinking and possible ways of measuring them." (p.2)

As an example of a useful standardized test, the Watson & Glaser Critical Thinking Appraisal instrument contains subtests measuring five types of thinking:

1-inference
2- recognition of assumptions
3- deduction
4- interpretation, and
5- evaluation of arguments.

Another example - The Cornell Critical Thinking Test: Level Z,focuses on:

1- induction
2- credibility
3- prediction
4- experimental planning
5- fallacies
6- deduction, and
7- identification of assumptions.

A third measuring inventory - Chickering's Critical Thinking Behaviors, requests students to indicate the percentage of study time spent on several activities:

1- memorizing
2- interpreting
3- applying
4- analyzing
5- synthesizing, and
6- evaluation.

A fourth assessment device, developed by McKeachie, Slater, Smith and Hiler - a test for psychology, contains eight subtests:

1- tendancy to make value judgements
2- distinguishing between empirical and non-empirical problems
3- choosing testable hypotheses
4- interpreting graphs
5- deriving warrented conclusions
6- discriminating between reasonable conclusions
7- detecting implicit assumptions, and
8- designing simple experiemnts.

Two other measures, open-ended assessments of thinking, typically allow students to demonstrate the most valuable kind of thinking -"the kind that is most often used to make decisions and solve problems in real-life situations", (Hart, 1989:p.2) include:

1) Knefelkamp's (1974) and Widick's (1975) Measure of Intellectual Development; an essay test involving:

1- decision-making
2- careers, and
3- classroom learning.

2) Ketchner and King (1981) , the Reflective Judgement Interview in which a student is questioned about a moral or ethical dilemma which is presented to them both orally and in writing.

And finally - (Steele, 1986) developed:

"a measure of reasoning (in the American College Testing Program), as part of its College Outcomes Measures Program (COMP). COMP uses written and audiotaped stimuli to which subjects respond by writing letters, for

example, to a legislator, or by role playing or speaking to a friend or group. COMP assesses the student's identification and clarification of principal issues, costs and benefits, and potential problems and solutions." (Hart,1989: p.2)

Conclusion:

Should college students be required to successfully complete critical thinking courses? Pecorino's (1986) reply, which I strongly support, is:

"Yes, by all means and for all students, because all educated people, and certainly all those who are awarded degrees in higher education, ought to have such skills." (p.14)

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